

LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Oct. 10-14, 2011.



THE DANGER IS IN THE AIR



At right, LLNL health physicist Brooke Buddemeier, who is shown training emergency responders, has delivered hundreds of presentations about the value of preparedness in mitigating the impacts of a nuclear detonation in a major U.S. city.

While New York City officials were touting the blanket of radiation detectors around their city, a Laboratory researcher provided a sneak peek on how to mitigate the threat of a nuclear blast.

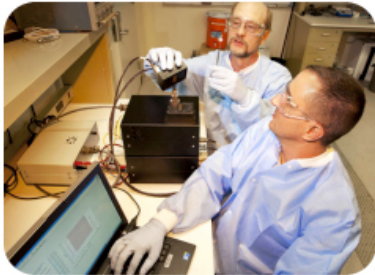
The detonation of a nuclear device in Manhattan was the subject of a closed-door meeting where more than 150 police, fire and federal officials learned about what would happen after such a blast and how the public and emergency responders could be protected from fallout.

A key part of the talk was a vivid computer graphic prepared by Brooke Buddemeier, a certified health physicist at the Laboratory, showing how fallout from a bomb at Times Square could be taken by winds over the rest of New York City and parts of Long Island. A large-scale exercise to detect a fake nuclear bomb is planned for Long Island in December.

To read more, go to the [Web](#).



TIME IS ON YOUR SIDE



Mechanical engineer Reg Beer (right) and electronics engineer Gary Johnson test a new polymerase chain reaction (PCR) instrument that can process biological samples in less than three minutes.

Wouldn't it be great if there were a technique that could help diagnose a patient before a doctor even has a chance to sit down? Lab engineers say such a technique might arrive sooner than expected.

The LLNL team has developed a DNA analyzer that can process samples in minutes, instead of at least a half hour. The machine takes the tiniest sample and sequences DNA from it by a process called a polymerase chain reaction (PCR). It's the same process behind forensic tests for crimes, paternity tests, and tests looking for genetic diseases.

The idea for a faster machine was spawned from an engineer who was frustrated when he had to wait two days for a lab test to confirm his daughter's diagnosis, to see if she needed antibiotics.

To read more, go to the [Web](#).



Color-enhanced scanning electron micrograph shows splenic tissue from a monkey with inhalational anthrax; featured are rod-shaped bacilli (yellow) and an erythrocyte (red). Credit: Arthur Friedlander

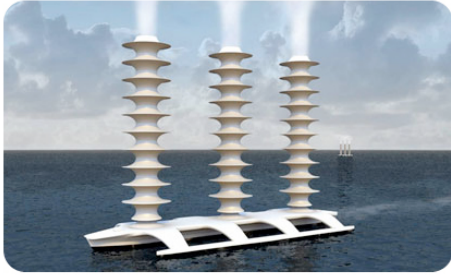
Lab researchers have developed a new anthrax vaccine that works better than conventional single protein vaccines.

The Lab team has pioneered the use of nanolipoprotein, or NLP, technology. They've already used it to create a successful vaccine against West Nile Virus.

Vaccines made this way are more durable, and can be freeze-dried, rather than having to be kept cool in a refrigerator and handled under special conditions. They can be inhaled in a mist, as some flu vaccines are.

Livermore Lab has patented much of its NLP technology and hopes it will lead to an entire new generation of treatments.

To read more, go to the [Web](#).



One of the geoengineering solutions to climate change: marine cloud whitening (spraying seawater droplets into marine clouds to make them reflect more sunlight). Photograph: NASA

Geoengineering the climate, which could include placing sun shields in the sky to reflect more sunlight back into space, is the last and scariest option if humans don't reduce their carbon emissions.

That's the message from LLNL's Jane Long, an associate director-at-large. She is convinced that the only sensible way to combat climate change is to work toward a zero-emission energy system as fast as possible.

As chairwoman of the Bipartisan Policy Center's 18-member task force on geoengineering, the hydrologist and energy expert realized two fundamental things: that the world has still not come to its senses on global warming, and that science would be remiss if it didn't consider the possibility that CO₂ emissions will continue to soar for decades.

The report called for a comprehensive study of geoengineering options — including removing CO₂ from the atmosphere, and reflecting solar energy back into space — in case Earth's climate crosses certain tipping points, such as a mass release of methane from the Arctic that would drastically warm the planet.

To read more, go to the [Web](#).



NO CONVERSION NECESSARY



Avi Thomas adjusts the bioAMS instrument. Photo: Jacqueline McBride/LLNL

The Laboratory is on the road to purchasing a new biomedical accelerator mass spectrometer (bioAMS) instrument that will provide faster analysis for medical and other biological research.

Historically, no matter what form a biological sample started out in, it had to be converted to graphite before being analyzed in an accelerator. The traditional AMS technology required operation by experts in disciplines far removed from medical fields, unforgiving special chemistries to prepare samples for analysis, and extensive time required for that sample preparation -- all factors that have impacted its utility for clinical researchers.

However, in recent years, LLNL investments have allowed researchers to develop an interface that would handle liquid samples and bypass the graphitization process. The new instrument will couple with this to rapidly and cheaply perform biomedical human subject tracer studies and body burden assessment addressing important questions in nutrition, toxicology, pharmacology, drug development and comparative medicine.

The instrument will be purchased using \$3 million grant from the National Institutes of Health.

To read more, go to the [Web](#).

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in

high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

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